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DISEASES OF THE NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

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DISEASES of the NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

Clinical Trials With Cortisone In the Treatment of Chronic Schizophrenia

JAY B. COHN, M.D., LOUIS J. KARNOSH, M.D., and ROBERT M. STECHER, M.D.
Cleveland, Ohio

Most of the recent studies found in the current literature on the effects of cortisone on the major psychoses record the results as being variable, transitory and inconstant. Having encountered a rather unexpected and most favorable response in one schizophrenic patient,[1] the authors were stimulated to extend this therapeutic experiment in other schizophrenic patients and to include some psychological tests and blood count correlations.

Six schizophrenic patients were selected whose illness had endured for at least two years and whose behavior was so unpredictable and whose general mental state had so deteriorated as to require prolonged hospitalization. All these patients had run the gamut of psychotherapy, electric shock treatment, insulin coma and one had been submitted to transorbital lobotomy. In every instance the above mentioned therapies had been completely ineffective. In other words the observations reported here concern patients whose psychosis was severe, chronic and refractory to all conventional forms of treatment.

In planning cortisone therapy it was decided to use the drug in large enough doses to assure a positive physiologic effect. Usually on the first day an intramuscular injection of 200 mg. was administered in one dose. During the second day a single dose of 100 mg. was given. Thereafter a maintenance dose of 50 mg. twice daily was the rule as long as the patient continued to improve. This medication was then reduced in some instances to as low as 25 mg. a day. The entire period of cortisone treatment varied from seven to thirty days. It was necessary to discontinue administration of the drug in two instances because the relatives were unable to pay for the cortisone.

Case Reports

Case I. W.B., a white male, age 37, was admitted to a veterans' hospital in July 1948 with an active psychosis. He was discharged from the Army in February 1946 and gradually developed a psychosis characterized by ideas of reference, by an abnormal concern over his bygone sexual practices, by delusions of infidelity and by moods of self-condemnation. In the course of his illness and prior to cortisone treatment he had received 50 hours of insulin coma, a long series of electric convulsive treatments and finally a combined schedule of electric shock and subcoma insulin.

This patient was given 100 mg. of cortisone daily for ten days, after which the dose was reduced to 50 mg. daily. During the course of the treatment with the higher doses he became confused and presented some of the features suggestive of a toxic psychosis. After reduction of the dose the confusional features disappeared, he became more accessible and hallucinations were not so frequently manifested. The 50 mg. daily dose was maintained for four weeks. The patient continued to remain in good contact with his surroundings although he still re-

acted with definitely impoverished affect. He denied any hallucinations and he demonstrated only occasional blocking, being able to carry on a fairly natural and spontaneous conversation. Consequently he was allowed extended visits to his home, where he reacted very well and he was discharged. For more than nine months he has maintained a good remission, has been working as a metal inspector, and his wife testifies that his general demeanor is essentially that which he displayed prior to his acute illness and to his induction into military service. In follow-up studies the only deviation from the normal mental state is a slight colorlessness of affect and a cautious, slow, overdeliverative style of speech.

Case II. W.V. is an 18 year old white male whose illness first became evident in 1949. The earliest symptoms were an extreme nervous tension and anxiety of a hypochondriacal nature with the persistent complaint that he could not sleep because of a constant jerking of his arms and legs. A few days prior to his admission to the Cleveland State Receiving Hospital his mental illness suddenly took a violent turn. He obtained a hatchet and threatened his father with it when the latter attempted to leave the house to obtain help. The patient prowled about the premises looking for a gun and locked all the doors. He talked vaguely of self-destruction.

After admission to the hospital he was given electroshock treatment and a full 60 hours of deep insulin coma. He reacted with a fair remission of symptoms and was discharged as slightly improved. However, for the ensuing nine months his home adjustment was rather poor. He manifested no iniative or any desire to go to work and sat about in a mild catatonic state. However, his appetite remained normal and he managed to take care of basic personal needs. When readmitted to the hospital he was found to be actively hallucinated and projections took the form of a belief that he was surrounded by spies and Communists. Again he responded indifferently to a series of 30 electroshock treatments and again this was followed by 60 hours of deep insulin coma. Despite this heroic treatment the patient continued to show a complete flatness of affect, was indifferent to his surroundings and spent most of his waking hours in bed with his head jammed into the bed springs. Much of the time he required strict isolation because of his belligerence. He displayed no appropriate affect and made no signs of recognition when his family visited him.

The patient was started on a course of treatment with cortisone; 200 mgs. intramuscularly the first day and 100 mgs. daily for the next 16 days. He responded with a remission from his torpor and autism on the sixth day of treatment which he demonstrated by a greater interest in ward activities and a more natural emotional behavior toward personnel and his parents. Because of this surface improvement the dose of cortisone was dropped to 25 mg. twice daily. However, after four days of this low dosage blocking and inaccessibility returned. Raising the medication to 50 mg. twice a day again made him more amiable and cooperative and for this reason this dosage level was maintained for another month. During this period other and less costly measures were considered in an attempt to maintain the remission. Accordingly while still under cortisone routine the patient was given electroshock treatment and for over a month after termination of all treatment he has shown a very satisfactory behavior and a better affective coloring. It is significant that prior to cortisone treatment electric shock therapy made little or no impression upon his psychosis.

Case III. M.B., a 26 year old white woman, had become incapacitated about 4 years before with what appeared to be an hysterical hemiparesis which followed an assault by her stepfather. From the very onset the patient complained of inability to walk, of fear of people and of dark places, and a very pronounced horror of her mother and the stepfather. She had an extensive course of psychotherapy at various medical centers with no positive improvement. Several series of electroshock treatments produced little more than transitory relief. In addition to these treatments she received deep coma therapy without any lasting results. The

family of this patient was unable to provide much cortisone because of the expense but it was decided that a trial was worthwhile. Accordingly she received 100 mg. daily and this dose was continued for 2 weeks. Her eosinophil count dropped after four days to one-half of the pre-treatment level. At the same time she began to show marked improvement, her fears abated, she became physically animated and even volunteered to do some typing work in the hospital office. On one occasion her medication was delayed until late in the day and the patient demanded it in a most emphatic manner, insisting that she felt much better with its use. After two weeks the cortisone dosage was reduced to 25 mg. daily which appeared to be adequate. The eosinophil count rose rapidly, however, and there was a parallel return of mental symptoms. After increasing the dose to 50 mg. daily her former remission status was regained. This favorable state was maintained for some ten days when her supply of cortisone was exhausted. Within a week she relapsed completely and the impression was gained that had the maintenance dose of 50 mg. been continued, she may have been able to enjoy a fairly good mental status.

Case IV. In this white male patient of 26 years, signs of mental breakdown developed quickly after his emigration from Czechoslovakia to this country some two years ago. The abrupt transition from one mode of living to another provoked much anxiety and tension. He finally fell back upon projections and claimed that he was being poisoned and hypnotized. He was obviously hallucinated and also self-accusatory when first admitted and demanded that a priest be called to hear his confession. The working diagnosis of paranoid schizophrenia was made and he received a total of 50 electroshocks in three divided courses. These had but fleeting value as did an insulin coma routine which followed. After laboratory tests including glucose tolerance test, blood studies, particularly eosinophil counts, the patient was started on cortisone. He received 100 mg. twice a day for eight days. Eosinophil count of 205 before treatment dropped to 6 after four days of cortisone. He became completely clouded and demonstrated a true toxic confusional state. During this semi-delirium he reverted to his native language, was hallucinated and completely disoriented, the clinical state being quite similar to that seen after prolonged electric shock therapy. The cortisone was discontinued and within a week eosinophil counts rose to pre-treatment level and his toxic psychosis gradually cleared. Within a few days he resumed conversation in English, was well oriented, pleasant and was making a good ward adjustment. For two months he has maintained a satisfactory remission and except for some colorlessness of affect he is showing no active psychosis. In retrospect it is concluded that the confusional toxic state provoked by the cortisone was in itself responsible for the improvement in his schizophrenic illness.

Case V. M.K. is a 35 year old white woman who has been a psychiatric problem for over six years. Her illness began with what appeared to be psychogenic headaches. Very soon she withdrew into a mute and abulic state and appeared to be in poor contact with her milieu. Treatment in a sanitarium with electroshock made little impress on her condition. The situation was further complicated by a pregnancy. When the baby was born she manifested no natural interest in her offspring and was unable to take care of it. In the post-partum state she became much worse, was hallucinated, dissociated and negativistic. Both electroshock and insulin coma of 60 hours produced but transitory improvement. She displayed nihilistic delusions, claiming that she had no head and denied the existence of other vital organs. Her attitude toward recovery was one of futility, and she entertained no ideas anticipating discharge and return to family obligations. Her general demeanor was that of a depressed affect. Transorbital lobotomy was performed as offering the best promise of obtaining relief because of the utterly depressed and morbid mental state. The procedure was practically without benefit.

After the usual laboratory studies were completed, cortisone in 100 mg. oral doses each day was administered. After three or four days the patient appeared to be quite free of morbid affect and expressed the opin-

ion that "these feelings in my head may be imaginary," and manifested a more natural interest in the ward activities. This improvement was maintained for a two-week period during which the 100 mg. dose was maintained. At the present time she remains on a schedule of 50 mg. daily which dose will be continued for a period of two months. Whether this treatment will promote further improvement remains to be seen; however, it is significant that all other radical therapies including lobotomy failed to modify the psychosis while cortisone had provided at least a well-sustained remission.

Case VI. L.S., a 29 year old male, an X-ray technician by occupation, returned from European military service with the symptoms of a mild depression. At the time of his admission to the Cleveland State Receiving Hospital the mental content contained a great deal of paranoid coloring and falsification of reality. During a period of catatonic excitement he sustained a severe back injury which contraindicated electric convulsive treatments. On a program of informal psychotherapy which was prolonged for a period of two years no improvement was noted. After this he made a half-hearted attempt at part-time work in the X-ray room. He rationalized his apathy and lack of initiative in terms of his injured back, and consistently refused all medication. After appropriate psychological and clinical observation it was concluded that he had a well established schizophrenia.

Approximately ten months ago he was placed on the cortisone schedule with 100 mg. daily for ten days. Other than electrocardiogram, sodium and potassium levels, no preliminary studies were made at this time. Within three days he began to take interest in family affairs and decidedly more enthusiasm in his work, which he took up full time. For the first time in many months he expressed an eagerness for social recreation during evening hours. His appetite was voracious. The dose of cortisone was accordingly reduced to 50 mg. daily and later to the same dose but given every other day. This happy state of affairs in reference to his mental improvement continued for two months after which he himself suggested termination of the treatment. More than seven months have elapsed and according to his family he "works and plays as though he had never been ill."

Discussion

Six patients who had suffered prolonged schizophrenic illnesses were treated with cortisone with marked clinical improvement, despite the fact that they had all received insulin coma and electric shock therapy and one had had prefrontal lobotomy without improvement. Benefit since stopping cortisone has endured for nine months in one case.

It has been well demonstrated that schizophrenic patients are refractory to adrenal stimulation with ACTH. Pincus's work[2,3,4,5] indicates that the adrenal cortical response is poor in schizophrenics, being poorer in chronic schizophrenics than in acute cases. If this be true, it would seem logical to attempt to supply those patients with adrenal substances to correct this deficiency. Cortisone represents only one of many replacement factors, but it seems to be the most effective fraction which can be applied in a wide range of illnesses characterized by adrenal cortical insufficiency. Thus we are replacing substances that the schizophrenic patient apparently cannot produce.

Laboratory studies show that in our schizophrenic patients cortisone in moderately high doses produces a prompt adrenal response indicated by the drop in floating eosinophils within a period of four or five days. Furthermore, this reaction is usually accompanied by a parallel improvement in the patient's mental symptoms. The later temporary relapses and exacerbations noted when the drug was discontinued or the dose reduced are further correlated with the eosinophil levels. In addition these studies give one the impression that electric shock therapy will maintain the same eosinophil level when the cortisone has been withdrawn, which finding is in accord with that of Parsons et al.[6] Despite the published report[7] that the adrenal response to electric shock therapy represents "a non-specific reaction to stress," we feel that electroshock therapy and cortisone do have similar effects; that is, they operate in synergistic

fashion. Those patients who were unresponsive to electric shock prior to treatment with cortisone became responsive to electric shock after treatment with this agent. Woodbury and Sayers[8] have shown that "cortisone heightens the susceptibility of the brain to convulsions." In their study they demonstrated that the electroconvulsive threshold for a complete convulsion was lowered by the use of cortisone and increased in the use of desoxycorticosterone acetate. One might speculate that the adrenal refractoriness in the chronic patient which causes him to be non-responsive to electric shock therapy has been altered by a course of cortisone.

This exploratory study strongly suggests that there is a relationship between the chronic elements of schizophrenic illness and certain deficiencies in adrenal gland function. It appears to us that cortisone counteracts some of the factors which provoke chronic mental diseases. It is our opinion that further studies along this line in psychotic patients are warranted.

Summary

Six long-term patients with schizophrenic illnesses who had been previously treated with electroshock, insulin and lobotomy manifested improvement and in some cases a complete remission after treatment with cortisone. This study indicates that cortisone and electroshock therapy are synergistic in action and both result in an adrenal response which seemingly is proportional to the improvement in the patient's mental status. Further basic studies in the relationship between the adrenals and the psychotic illnesses seem warranted as a result of this investigation.

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Nuns' Melancholy

G. B. PEARSON, M.D., and J. O. FERGUSON, M.D.
Pittsburgh, Pennsylvania

Religious belief plays an important part in our life. According to individual need most of us pray, a few scoff. Anomalies of religious thought and practice attract the attention of theologian and psychopathologist, while average religious experiences, less well understood, are taken more or less for granted. What we come to know in time, will probably come then from our continued study of the disordered schemes.

Few introversive persons fail sooner or later to dip into their philosophy with the hope of explaining what to them seems inexplicable. The psychopath, the depressed person, the obsessive-compulsive person do this occasionally. It is in schizophrenia, drawing heavily on magic and mystery, that the religious delusion and hallucination comes to their richest if most bizarre flowering.

Maloney in his *Magic Cloak* takes a long stride in this direction when he describes the case of Gwendolyn G., her metamorphosis and identification with Christ: "She could ignore the hostile reality which burdened her with so many threats to her security."[1]

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Maloney in his *Magic Cloak* takes a long stride in this direction when he describes the case of Gwendolyn G., her metamorphosis and identification with Christ: "She could ignore the hostile reality which burdened her with so many threats to her security."[1]

Several years ago Jackson Thomas reported on the delusions of a schizophrenic girl who believed herself a Virgin Mary. He called attention to "the manner in which the patient has utilized accepted religious experiences to render tolerable certain instinctive urges."[2]

Campbell frequently referred to the constant or partial use of religious motifs in schizophrenia. He said "the lives of the Saints give excellent examples of hallucinations in delicate personalities grappling with their destiny. Our patients, too, are at grips with destiny and in them also the hallucinatory experiences must be considered in relation to type of personality, instinctive conflicts, imaginative endowment, cultural background."[3] Campbell, it is recalled, discussing a patient with the fixed idea that he was destined to preach and to save the world asked "is this man insane or is he a minor prophet?"

In discussing schizophrenic patients showing what he called a distorted world picture with wish-fulfilling fantasies, a world picture the receptacle for the discordant components of the personality, Campbell said "fantasy is called on to supply what real life has denied, but the fantasies are not woven into a structure which is compatible with a normal social adaptation"; "in this type of reaction we deal not with fantasy supplying a deficit but with a rejection of responsibility for disturbing elements in the personality which cannot be altogether eliminated or ignored."[4]

Clark, a former student of Campbell's and more recently a student of Jung's, has made a quite complete report on what he called a pathological development of "cosmic consciousness" in a catatonic schizophrenic. He drew attention to how the schizoid personality, with lopsided capabilities and his full potentials little touched, often tries to change the world by joining radical or reactionary movements or by philosophical reasonsing, or by fantasy if these other methods fail. He suggested "taking the mystery out of mysticism" by a more widespread knowledge and appreciation of religious values in relation to the higher levels of personality integration.[5]

Three hundred years ago Robert Burton[6] described the melancholic state of maids, nuns and widows. He placed the cause of the melancholy thusly: "—the brain—not in essence but by consent—the whole malady proceeds from—(that source)—from which come care, sorrow and anxiety—or any other violent object or perturbation of mind."

The physical complaints, the emotional variability, the nightmares and strange, incongruous thoughts received their share of attention: "—they think themselves bewitched, they are in despair—troubled with an evil spirit—some think they see visions, confer with spirits and devils, they shall surely be damned, are afraid of some treachery, imminent danger—."

His grasp of the cause was further indicated when he indicted "—rash vows—(which) suppress the vigor of youth—to the prejudice of their souls' health and good estate of body and mind—." "Sabini quod volunt somniant, as the saying is, they dream of what they desire."[7]

Even if they were of no more than antiquarian value, Burton's comments add a special flavor to the case records—and the persons, of course—of four nuns who are patients in the Dixmont State Hospital. These records were first read because of the coincidence of finding so many nuns (altogether, 11 or 12 representing several Orders, the four records used being the most complete) in the relatively small census of this general mental hospital, and then were reviewed in the light of Burton's comments.

Case Histories

Case 1: Sister R, born in Austria-Hungary in 1898, was the youngest of nine children. At eleven she came to the United States to live with a sister who had preceded her. She attended a public school for a while, then a Catholic boarding school and learned to speak English; she decided to become a nun, a decision her sister fruitlessly opposed. She became a novice at fifteen or sixteen, later made her final profession.

She wanted to be a teacher or a nurse, but from the beginning she was disappointed. In the Convent she was assigned to work as a housekeeper and seamstress; there were only occasional periods when she served briefly as a substitute teacher. She constantly felt that other Sisters kept her back, interfered with her work, ignored her, watched what she was doing and wanted to get rid of her. Each new Superior was arbitrary and she resented and ignored each, returning for counsel to the elderly nun who had been Superior when she

had been made a nun. For this behavior she was criticized and made to do penance.

When she was about fifty, her increasingly distorted attitude forced the Community to take steps to hospitalize her. She was unfriendly, nervous, short-tempered and cruel to the children in school. She felt there was a clique assigned by the Superior to watch and to harass her, that other Sisters insulted her and kept her from her needlework; she grew more hostile and threatening to the other Sisters. Admitted to Dixmont,* she resigned herself to the situation with depression and humility, concentrated on the persecutions to which she had been subjected.

To her doctor she talked freely of her feelings of having been discriminated against as a foreigner; said that a group of Sisters had paid undue attention to her conversations and reported them to the Superior, their gestures and mannerisms referred to her, her phone conversations were overheard, and in general other Sisters and the Superior arbitrarily had excluded her from the Order.

After a while she said that she no longer harbored ill feeling towards anyone though she felt bewildered and concerned about her prolonged detention in the hospital. She professed to retract some of her earlier statements about having been discriminated against, and said that she could see where her limitations and lack of qualifications for advanced training had interfered with her expectations. She further said that she had come to subordinate all her personal interests to the general policy of the Community; but at the same time it was obvious that she did not want to discuss many things, retreating behind the generalization that they were Community business and policies.

Her Superior said that her distorted attitude was a general one, towards everyone and everything, and had been twenty-five years in development.

Case 2: Sister M. was born in Pennsylvania in 1892, the younger of two children. When she was five her parents separated; she continued to live with her mother who worked as a domestic. When seven or eight she came to Pittsburgh to live in an Episcopalian home (at this time she was a Protestant); soon her mother also came to Pittsburgh and the two lived together in a small apartment where she did all the housework while her mother worked. At fifteen she finished common school; after clerking for a while in a store she went to a business school and subsequently was employed as a stenographer.

At eighteen she was converted to Catholicism; at nineteen she became a novice but after several months, due to her mother's protests, she was advised to wait a longer period of time before making a definite decision.

She left the Convent, lived in a boarding home with other employed girls, had boy friends, considered marriage, but finally decided to become a nun. At twenty-one she re-entered the Convent, a year later receiving her habit. (Years later she said other Sisters became jealous of her at this time because of her outstanding work as a stenographer and the Bishop's friendship.)

She worked hard as a teacher, became interested in science, attended college and at fifty received her master's degree. She was considered efficient in her work although in later years she said she had been discriminated against in the different schools where she taught.

At thirty-one she consulted a neurologist because of general nervousness. At thirty-five, in an eight month period she had a number of operations including a mastoidectomy, tonsillectomy and suspension of both kidneys. At some time not stated in the record, she had a hysterectomy. At thirty-nine she spent two months at a spa because of nervousness.

According to her, she had no difficulties until she was fifty-one, when a new Superior was elected and a clique of older nuns began to work against her (Sister M); she felt she was maliciously moved from one school to another, that principals interfered with her teaching and other teachers were disrespectful. Difficulties in school became frequent and severe so that she was removed from teaching. At fifty-six she felt nervous again and decided she needed a complete rest; without permission she left the Convent and went off to Florida with a lay friend. On her return she felt constantly persecuted by the Mother Superior and her council. She began to write letters to the Bishop and on her own initiative left the Convent to go to see him to lay her complaints before him in person.

Her situation in the Convent became so much worse that arrangements had to be made to send her to a mental hospital. Here she said that her mail was tampered with, that a volume she had written about her persecutions was taken from her and destroyed. She said that the hospital authorities were carrying out orders from the Mother Superior. She said she was close to God and God close to her.

Transferred to Dixmont, she said that her transfer and further hospital care were a continuation of the persecution. She complained of attendants mistreating her and talking about her. (She was usually negative to routine and suggestions.) She felt and acted as though she should have special privileges. There was always much self-pity and crying. She wrote lengthy letters about her persecutions to her doctor. Memory, judgment and reasoning were affected by her bitter feeling.

In the analysis of the case by the hospital physician (JOF), he pointed out that she had expected to find in the Order an ideal community where all was beautiful and all her fondest hopes would be realized.

She was disappointed when she found that the members of the Community were human, like herself; then what she saw and heard she magnified,

*In each case, the hospital of first admission was the St. Francis Hospital, Pittsburgh, Pa., and patient was subsequently transferred to the Dixmont State Hospital.

gave to ordinary occurrences personal and unusual significance; she read special meanings into commonplace events. She came to believe that only she had courage to speak out, but because she did so she gained the ill will and wrath of the authorities in retaliation. Her chief desire became a complete investigation of the Community, with her absolved of all criticism and freed from the hospital.

Case 3: Sister C. was born in Pennsylvania in 1885, the second of eleven children; one of her brothers became a priest. She was a normal, usual child. She attended a parochial high school, was deeply impressed by the work of the nuns, imitated them in her dress. She was friendly, motherly, deeply religious. Her mother and the family priest encouraged her to become a nun in spite of her father's objections. At eighteen she entered a Convent; she took college courses and later received a bachelor of science degree; she taught school for forty years.

As a nun her life was exemplary and austere, quiet and unemotional. The deaths of her parents and a brother caused no emotional reaction—all was "in the Hands of God."

When she was about forty-five she became mildly suspicious of the sincerity of other Sisters, but apparently this was either not too extreme or was graciously overlooked. It was not until she was sixty-two, a patient in a general hospital for a minor operation, that her mental symptoms abruptly became obvious to all. She said that doctors and nurses were talking about her in the corridor outside her room, and publicly rebuked them. She returned to the Convent for convalescence and here the ideas that were first seen in the hospital became worse. She became anxious and worried; she was afraid she was going to be shot; voices spoke to her, threatening her; she visualized people of national and religious importance. She said that General MacArthur and the Pope appeared to her and spoke to her, and the Pope said he was going to take her to Rome. The situation in the Convent became very difficult and arrangements were made to hospitalize her. On the way to the hospital she thought that men in cars followed her and were going to shoot her. She thought she was being taken to see the Pope.

Now sixty-five, she is a tense serious woman with innumerable well-fixed ideas and hallucinations of reference, persecution and grandiosity. With little urging and only mild concern she describes how poison is mixed into her food, how she is constantly disturbed by shots at night and snakes are loosed in her room, how day and night the accusing voices of nuns describe her sexual aberrations (masturbation, intercourse, exhibitionism). She believes other nuns persecute her for her great wealth. She asks that she not be called Sister C but by her civil name, although she really is Mrs. General MacArthur. She sees no contradiction between her vow of abstinence and her "marriage," pushes off all objections by saying that she had dissolved such minor difficulties. She firmly believes that a group of Sisters at the Convent have conspired to destroy her reputation, that she is innocent but everyone else false and hostile, that newspapers publish lies about her. She feels powerless to prevent further persecution, complacently accepts torture, is somewhat comforted by prayer and her pastor "speaking" to her and the Pope "visiting" her. She says that the moral dissolution of the Order began before she entered it—but she was happy there and never once dissatisfied.

Case 4: Sister M. G. was born in Ireland in 1897, the thirteenth of sixteen children in a poverty-stricken farmer's family. Three of her sisters also became nuns.

She was brought to this country at eleven by American Sisters who were visiting in Ireland and under their guidance sent to school. At fifteen she received her habit and at seventeen took her final vows. She was a substitute school-teacher for a short time but mainly worked as a janitress, kitchen helper and laundress. At twenty-sight she graduated from a Catholic school of nursing; she was licensed but never practiced nursing except to care for sick children and nuns in the school and Convent. Before graduation the authorities of the school of nursing advised her Superior against her becoming a nurse because she seemed excessively interested in men.

Because of her wilful, immature ways of behaving and talking, she was examined at thirty-one, by a competent neuropsychiatrist who made a diagnosis of dementia praecox. He advised hospital care but the Order decided otherwise. She became progressively worse—she was irregular, destructive, and undependable in her work, her behavior was unbecoming to a nun, she was profane and annoyed others by her loud hostile talk.

At forty-six she was admitted to a mental hospital for general care. There was a lull in her symptoms but after she returned to the Convent her overactivity began again. She was increasingly overactive, aggressive and threatening; she felt she was persecuted and attacked other sisters and the Superior. Consequently, at fifty-three she was admitted to the St. Francis Hospital again and this time given electric shock treatment which caused her symptoms to subside temporarily.

On this admission she said that in the school and Convent children and nuns played tricks on her, talked about her and were jealous. She said she could hear God talk to her. She was suspicious, quick and violent-tempered. She became excited when near men and showed-off in front of them. The Superior said she was usually preoccupied, often had outbursts in which she thought people were coming after her and yelled at them to get away. Instead of returning to the Convent this time, she was transferred to Dixmont.

Here she was found to be talkative, apprehensive; her conversation was circumstantial, and difficult to interrupt. She intimated that she had been poisoned by doctors and nurses in St. Francis.

Subsequent examinations showed her to be distractible and antagonistic, angry but not emotionally labile.

She talked spontaneously about priests persecuting her and said she could hear their voices defaming her character. God, she said, spoke to her. The center of the circle of persecutors was the Sister Superior, abetted by priests and nuns; the content of the persecutions was her Irish ancestry and her sexuality.

On one occasion she spoke at length on her attraction as a young nun to a handsome young priest. She said she made excuses to see him and talk to him. They embraced several times but there were no further intimacies. However, she was reprimanded for her interest and now voices talk constantly about it and accuse her of sexual irregularities.

Comment

Four cases are certainly too few on which to establish any generalizations, but through these records run certain common threads.

Our patients are all women, single, Catholic, nuns—each word significant. As girls three were devout children, early indoctrinated into the mysteries of the Sisterhood; the fourth was converted to Catholicism in late adolescence. Two women were foreign-born; both felt this was to their disadvantage and incorporated their feelings of inferiority into their psychotic systems.

It is interesting to note at what an early age these women chose the religious life, so early that three can be said to have had no girlhood while the fourth had a difficult adolescence ending in conversion.

They came from poor families, economically. In their four households life was hardly smooth; Sister R's father was killed in a border incident shortly before she came to this country: Sister M, the convert, saw her parents separate, she too lost her father; Sister M G's family was poverty-stricken in Ireland; Sister C was one of a large family in a poor coal-mining community—undoubtedly the entrance of several children from each family into the church must have relieved the strain that existed there. Thus in each instance there was an event or a situation which was important, perhaps even more important than any "call to duty"; becoming a nun represented social and economic stability to these girls, in addition to their religious leanings.

Further, one nun as a child was opposed in her decision to become a religious by her sister, another by her mother, a third by her father. In the case of the nun who studied nursing, the school authorities advised against her practicing this profession. (Could any of these tragedies have been averted by heeding those intuitive objections?)

One woman had a moderate education, one was a trained nurse, one held a bachelor of science degree and the fourth her master's. All taught school to some extent; one was adept in music, another in science. As teachers they naturally came in close contact with children. In no instance, was any woman well or poorly distinguished, each having been an average nun in a practical, poor, working-teaching order. Each woman was industrious and sincere, having done in her religious life what we can readily call a good unselfish piece of work.

Three Sisters tended to be rigid and uncompromising beyond the point which their Superiors considered necessary as good nuns and teachers. The fourth was described as unusually willful and immature. (What would psychiatric examination and the projective tests have shown before they were accepted as nuns?)

Two women showed their mental symptoms first in mid-life; two in their early thirties were recognized as poorly balanced. In no case was there any outstanding physical disease, except as attributable to menopausal-aging changes, which could be held accountable.

In each case, including those not summarized, we are dealing with a paranoid reaction—the projection, as Campbell so well stated, of previously more-or-less successfully concealed discordant personality components and repressed instinctive urges. In two cases we see what a large role sexuality played; we can assume its importance in the other two.

Discussion

After due consideration of the data presented by these four patients, it seems to us that they agree in general with our body of knowledge of what may happen to the vulnerable personality under conditions of stress and strain. What has taken place in each patient, the personality disorganiza-

tion, is clear enough without further working-over. Clark, Thomas and Campbell, even Burton in his way, emphasized the fate of the eccentric schizoid personality which has recourse to fantasy. The impression we get is that these women—had they been nurses or school teachers or saleswomen—would have broken down in essentially the same way had equally adverse forces been brought to bear on them and equivalent conditions existed.

The data contribute in a way to our scanty knowledge of the psychology of religion, although as a precipitating factor in these cases, religion seems to have played a minor role. More important was its influence as a long drawn out and partial adjustment which may well have held back the ultimate appearance of the psychoses.

In these four cases there is actually less religious coloring than one might expect, no more than is often found in the mental illness of devout lay-persons such as the following. C. H., a girl with a mixed psychosis, schizophrenic thinking in a depressive setting, tearfully reproaches herself for having rejected the love and advice of her sister, a nun, and compares their conflict with the struggle between Saint Monica (her sister) and Saint Augustine (herself). H. C. pictures himself as a "devil with horns and tail" (he chants this to himself). D.D. tortures himself by searching the Bible for passages assuring him that he is not damned, unfortunately finds more to support the contention that he is.

One of our nuns, but not one of the four described, had a very dramatic illness which she herself likened to the tribulations of Saint Theresa. Her decision to become a nun was made when she looked at the holy picture, Ecce Homo, and was overwhelmed by its power and significance. A broken window in the Sacred Heart Chapel meant to her a "heart-crash." Things people said to her meant they wanted to honor her. As a young novice in church at Christmas time she experienced certain emotional stirrings within her which meant that the Church was about to recognize her as a saint. A priest, she said, told her the inner turmoil was the work of the Devil, disturbing the soul of a saint. A voice spoke to her in church, references were made to her in sermons, a pain in her arm meant that she was suffering for a world turned to war. She was tortured and tormented, obscene remarks were made about her. When dismissed from the Order, before she took her final vows, she rationalized the disappointment by saying that it was the Bishop's order, but that is the way He honors His saints. Finally she said she could hear constantly a rustling about her ears, the Holy Ghost in the form of a dove, with her and protecting her always.

It is interesting and important to ask, why did these girls become nuns. Although a judgment is retrospect, it is reasonable to believe that the choice of the religious life was dynamically logical in each case. Each girl may be presumed to have selected her career for personal and good reasons—not a "call" but the satisfaction of deep inner longings on one hand and the need for protection on the other. To each the religious life offered peace and security otherwise beyond her grasp.

The case of Sister M. illustrates this well. She looked for that equanimity of mind and soul which Dowson has described thusly:

> These watch the sacred lamp, these watch and pray;
> Calm, sad, secure; behind high convent walls
> These watch the sacred lamp, these watch and pray.
>
> Outside, the world is wild and passionate;
> Man's weary laughter and his sick despair
> Entreat at their impenetrable gate;
> They heed no voices in their dream of prayer.
>
> Calm, sad, secure; with faces worn and mild;
> Surely their choice of vigil is the best?
> Yea! for our roses fade, the world is wild; ;
> But there, beside the altar, there, is rest.[8]

Needless to say, Sister M., because of her great need, greater than could be met, failed to find the very thing she sought. To her, to each of these patients in fact, the convent was as barren as the world, as filled with disappointment, insofar as meeting their inner needs was concerned. The world and the convent both being meaningless and unable to satisfy the longing, fantasy was called upon in substitution.

What lies behind and beyond recourse to fantasy, offered in explanation by Thomas, Clark and Campbell? Is it possible to find

some deeper psychodynamic to explain why the patient selects this pathway?

Moloney's unique conception of masochism as being repression, extinction of that part of the self which strives towards expression, and submission to an authoritarian body seems to do this, giving us a better understanding of the person who accepts the submissive role on the one hand and the authoritarian body on the other.

Referring again to Gwendolyn G., Moloney sees her reaction as "narcissistic regression, identification with the Virgin Mother and with Christ, a folie a deux." Thus "she was not only the helpless little child endangered—but also the supreme power." Moloney describes Saul and Moses as going through the same process and points out the "masochism of a religious fanatic who believes he gains eternal juncture with an all-powerful God through self-abnegation."

With respect to the authoritarian body, the church (or the parent), Moloney postulates a head which directs the torso and its appendages, demanding obedience, expelling irritations, and subduing rebellion. The parent punishes, fortifies his attitude with the admonition "if you are disobedient to me when I attempt to punish you, then God, stronger than I, will punish you." The final authority, Church-God, threatens complete or partial extinction as the price of rebellion. (Conversely, presumably, love and acceptance are promised.)

If we accept what Moloney says, then the nun (or the psychiatrist, the clerk, as the case may be) may be said to wear a magic cloak through identification and submission. This cloak hides, disguises, protects and strengthens its wearer. Life is a state of submergence and surrender, a tenuous balance; show of independence, rebellion against authority whether in fact or in fancy, is met with stronger sanctions so that a balance of a sort is maintained. When it is no longer possible to continue the balance, the forward surge becoming too strong or the authority too punitive, then recourse to pathological fantasy, popularly called a psychosis, can follow.

Moloney says: "Every man is afraid in this horrendous world. To implement himself against dangers, he joins himself to a mighty ally who is supremely powerful and capable of overcoming all dangers. This ally fulfills a need derived from the inner feeling of helplessness. This ally fulfills the God-idea. If thoroughly embraced, this phantasy, this authoritarian illusion of oneness with a supreme being, liquidates fear."

Moloney's concept as applied to religious belief may not meet with favor on all sides, and it requires for completion the support of Thomas, Clark and Campbell. It is definitely helpful, without being a final answer, in our further understanding of delusional systems and hallucinatory experiences born and bred in religiosity. The melancholy of the nun is not distinct from the melancholy of any other person nor beyond human boundaries. It is not that the nun is a nun, not religion except as a stress, that causes the reaction, but the intrinsic defect within the person, that must be accounted for. In considering what may be the psychology of religion, we probably should not over-emphasize institutional religion as such, but give full weight to the predominance of the individual and his psychological background, having in mind that ultimately religious thought (or any philosophical outlook) is a projection from many individuals, its framework a product of their experience.

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Authors' Note: This paper is based on four case records, the patients are Catholic Nuns. No significance needs to be attached to the fact that they are nuns. We express our appreciation to Dr. Joseph Cammarata, Superintendent, for permission to use the records of Dixmont State Hospital in our study.

Decamethonium Bromide As An Adjunct In Electroconvulsive Therapy

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Introduction:

For several years there has been an active search for an ideal muscle relaxant drug for use as an adjunct in electroconvulsive treatments to minimize musculoskeletal injuries. While curare preparations, especially d-tubocurarine chloride, are effective relaxants, they may produce bronchoconstriction or sudden falls in blood pressure attributed to release of a histamine-like substance from the tissues. Muscle-relaxing doses also may produce respiratory depression of long duration.

Decamethonium (C_{10}) was synthesized simultaneously by Paton and Zaimis of London, and Barlow and Ing of Oxford University, working on the hypothesis that the potency of d-tubocurarine chloride might be due to the presence in the molecule of two quaternary nitrogen groups at some optimal distance apart. They therefore prepared a series of compounds separating the nitrogen groups by a carbon chain of different lengths. The most active member was the one with a ten-carbon atom chain, hence it was called C_{10}. The formula of decamethonium bromide, a white crystalline powder, is as follows:

$$(CH_3)_3.\ N.\ CH_2.\ CH_2.\ CH_2.\ CH_2.\ CH_2.$$
$$\quad\quad\quad

Technique:

A total of twenty-six patients, each receiving from six to thirty-one treatments, with two hundred and three separate administrations of C_{10}, were observed in this study. The ages of the subjects ranged from seventeen to fifty-eight years (average, thirty-four). All were psychotic. There were fifteen females and eleven males. In general the usual procedures of electroshock therapy were carried out—atropin, gr. 1/100 being given thirty minutes before treatment as the only premedication. With each patient, at least one to two treatments were observed without administration of the drug, in order to compare the severity of both the tonic and clonic phases of the convulsive seizure with and without "Syncurine." An initial dose of 1.5 mgm. injected intravenously over a period of sixty to ninety seconds was used. The dosage of nineteen of this group was increased to 1.75 mgm. with the second injection; four were kept on 1.5 mgm. doses; three were increased to 2 mgm. doses. The average time of administration of electric shock was between two and three minutes after C_{10}.

Results:

There was an estimated 30% softening of the muscular contractions. (Grob, Holaday and Harvey reported 50% softening with the shock administered from three to five minutes after C_{10}.) No fractures occurred and no undue muscular soreness was complained of. Spontaneous breathing was noted promptly in all but two patients, and the respiratory rate was actually slightly increased immediately following the seizure when "Syncurine" was used. The amount of cyanosis noted was about the same in all but one of these cases, but definitely more marked and of longer duration than that seen in the unmedicated patient. One patient presented definite respiratory paralysis. A thirty-eight years old white male, paranoid schizophrenic, with hypertensive cardiovascular disease and E.C.G. evidence of myocardial damage, was given initial doses of 1.5 mgm. "Syncurine" for several treatments with noticeable softening of muscular contracture. Cyanosis was always four plus. The dosage was increased to 1.75 mgm. for three treatments, with about the same observed results. On one occasion, 2 mgm. were injected, with resulting respiratory paralysis lasting five minutes, following a major seizure.

Summary and Conclusion:

While it is not the impression of these authors that the routine administration of a muscle relaxant or curare-like preparation is advantageous, it is our impression that the selective use of some such drug is necessary. Results in this series of the utilization of decamethonium bromide "Syncurine," (C_{10}), would indicate that a relaxing effect of at least 30%, and certainly not exceeding 50%, can be obtained with a dosage of 1.5 to 1.75 mgm. Dosage in excess of this apparently results occasionally in severe respiratory embarrassment necessitating the constant availability of forced artificial respiration and resuscitation techniques. Our impression from work with curare and d-tubocurarine would be that where very marked curare-like effect is desired, the d-tubocurarine is probably preferable to "Syncurine."

In this series, marked respiratory embarrassment did not occur with doses of less than 2 mgm. Respiratory embarrassment was noted with a dosage of 2 mgm. and necessitated the use of resuscitation over a period of five minutes in one patient with cardiovascular disease.

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Sodium Pentothal In Anxiety States

(A Follow-up Study)

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A preliminary study by the author[1] in December 1949 reported a series of 37 cases of anxiety state that showed substantial improvement following narcosynthesis using sodium pentothal. At the time of this report it was expressed that it was both necessary to study the cases presented for a longer period of time, in order to ascertain their continued improvement as well as to study a larger sample of cases, in order to evaluate more significantly the value of this technique. The criteria employed to evaluate clinical improvement are practical in nature, and include: the subsiding of the subjective symptoms that the anxiety state express, the return to normal of any specific pattern that has become perverted during the illness, and a favorable adjustment generally to all social and economic problems.

In this follow-up study we are reporting the substantial improvement of 85 patients who have received 275 interviews, the statistical distribution of which has been reported in a previous paper.[2] These statistics include the 37 cases previously reported which have now been followed from 18 to 36 months each as well as a group of 48 cases which have been followed from 3 to 18 months each.

We now present one characteristic case of each category of interview:

Case No. 1: J. P., a 25 year old, single male, was first seen on November 10, 1949. His chief complaint was an inability to eat in the presence of a date without vomiting, thus leading to his making a point of avoiding eating whenever out on a date. An extensive history revealed no significant cause for this reaction. The patient was subjected to a sodium pentothal interview and his response was dramatic. The interview revealed that the patient had developed a marked infericrity feeling as a child due to constant paternal reprimand for his eating habits. While in service, he became attached to a prostitute stating that she was very kind to him. On realization that the individual that demonstrated affection for him, which he so desperately needed, was not his personal property, it restimulated his feelings of inferiority and associated for the first time a feeling of nausea associated with sex. This condition persisted and became accentuated during his stay in a foreign country and on his return to this country on attempting to return to a normal pattern of living, he associated a feeling of nausea and the need to vomit whenever the opportunity arose to eat while out on a date. When the complete cycle of the pattern was explained to the patient, he seemed markedly relieved and accepted the explanation as logical. He returned for several office visits with psychotherapy and has continued to improve.

Case 2: D. D., a 27 year old, married male, was first seen on April 5, 1949 with chief complaints of acute headache and marked tension. Examination revealed no apparent organic or psychogenic etiology of the disturbance. However, upon subjecting the patient to two sodium pentothal interviews, it was revealed that there was marked frustration in two different channels. The first channel was directed to the fact that his first marriage had failed while he was in the ministry and thus caused a conflict of his moral values. The second channel was related to a marked insecurity in his second chosen field, that of teaching. The extreme desire to achieve success both in his field of teaching as well as in his current marriage placed him under great psychological tension. The slightest set-back in either of these two matters would set up a typical pattern of tremendous tension followed by violent headache. Following conscious interpretation, with psychotherapy and sedation the patient responded very well.

Case No. 3: C. McG., a 37 year old married female, was first seen on March 9, 1949. She had varied psychosomatic complaints referable to her head and legs, with expressions of tremendous anxiety. Routine history and examination did not reveal any constructive material from a therapeutic point of view. Upon subjecting patient to three sodium pentothal interviews, it was discovered that not only had she led an extremely unhappy existence at home due to the irregular habits of her husband, who was unemployed and an alcoholic; but also, that her own employment for many years by a physician had led to a strange physical and psychological relation with her employer. By a strange medical explanation, she had been led into a prolonged and consistent series of intimacies "for her health." Since it obviously was a difficult situation to condemn or condone, it was a matter of allowing the patient sufficient insight into what she desired to do, removing as much of the guilt feeling as possible in making a decision. When understanding brought about such a decision, coupled

with sedation and psychotherapy, the patient improved.

Case No. 4: M. C., a 25 year old single female was first seen on July 28, 1948. She complained of extreme weakness, which caused inability to work, fears of traveling and of ascending above the second floor of any building. It was quite difficult to establish good rapport with patient on a conscious level, since she seemed to resent talking about herself. She was subjected to a series of four pentothal interviews, under which she became markedly relaxed and responded alertly. The interviews revealed a strong revolt mechanism at home particularly directed at the father. Her first exposure to romance led her to engage in sexual intercourse as well as perversions. When this romance was terminated, she became markedly frustrated and she concluded that "all men are no good just as I always said." It was following this episode that the acute clinical picture blossomed to its fullest extent. By demonstrating to the patient the logical sequence of events that had occurred, and by explaining the benefits that could be derived from a normal relationship that proved favorable rather than frustrating, the patient began to improve. The latest communication received from the patient reported that she was quite well and contemplating marriage.

Case No. 5: R. S., 21 year old married female, was first seen on March 22, 1949. Her chief complaints centered about a marked nervous irritability, excessive anxiety and a marked restlessness. After an extensive history obtained in several interviews, including visits with the husband, there was no marked improvement and it was decided to subject the patient to sodium pentothal interviews. Five pentothal interviews were performed from which valuable and pertinent information was obtained. The major conflict was an extreme desire for success for her husband, whose progress up to this time was only mediocre and her intense wish to return to her native city where her parents lived. However, it was fundamentally necessary to her psychological structure to return home triumphantly. By demonstrating to her that her subconscious desires brought on her symptoms of anxiety, and by logical explanation of a constructive program to accomplish both purposes, the patient expressed renewed encouragement to her husband as contrasted with her former attitude of "unconscious" discouragement in the form of anxiety. Thus, the patient was successful in obtaining the desired end result attaining psychological security and has remained well.

....*Case No. 6: A. J. R.*, a 23 year old single female, was first seen on February 16, 1948. The patient expressed concern about the sexual phase of her life. At the time of the history the patient volunteered an extensive and bizarre history of sexual experiences culminating in the present relationship which was causing her great psychological distress. She had begun to demonstrate marked anxiety that had begun to impair her work. It was apparent that her reasoning in relation to this man was illogical even to the patient, and yet she continued in the same pattern. It almost seemed that the level of integration of the thinking processes that controlled the patient's activities was not on a conscious level but rather on a subsconscious level. The patient was subjected to sodium pentothal interviews. It required six interviews to gain a complete clinical picture. Under intensive questioning, it was revealed that due to an unstable family background marked by family indifference toward her, the patient became markedly in need of affection. In the early relationships, she felt psychologically secure for a short period of time, but invariably, since she felt no true affection, the relationship would dwindle as soon as interest subsided. However, in the relationship that caused her concern, she found an individual in whom she was extremely interested but who in turn demonstrated only physical interest in her, causing her great frustration. It was pointed out that it was necessary for her to find a situation in which she was physically as well as psychologically satisfied, both receiving and giving affection, before she would be able to make an adjustment. Shortly thereafter, such a relationship presented itself. The patient married successfully and is well and happy.

Case No. 7: E. H., a 25 year old single female was first seen on September 10, 1947. She volunteered many psychosomatic complaints referable to her chest and stomach. She was subjected to extensive examinations by competent internists on repeated occasions with no apparent pathology. Equally intensive psychiatric examinations revealed only the marked anxiety state and the hypochondriacal tendency, but no underlying factor. Following an intensive series of seven pentothal interviews, a complete clinical picture was ascertained. The patient had a severe problem in the family constellation. On the one hand the youngest child and only male took advantage of his favored position to tease the older children about their lack of the privileges which he received, and on the other hand, the oldest sister who, herself mentally disturbed with an acute anxiety episode, became belligerent toward the patient for her slightest complaint. Coupled with these constant emotional conflicts was an intense concern over the health of the parents. Ultimately, the tension had reached such a crescendo at home, that the slightest problems at work began to disturb the patient. In this case, it was necessary to go through methodically and minutely every contributing factor that had been elicited as a cause of the anxiety state, and with sedation and understanding attempt to rectify the overall picture in the patient's mind. With this intensive psychotherapy there was improvement.

While it is quite likely that much of the material derived through sodium pentothal interviews could have been obtained by direct questioning over an extended period of time, the narcosynthesis tends to shorten

the approach. Narcosynthesis does not replace psychotherapy, but is rather an adjunct to it.

To obtain a completely favorable response from only one interview is more dramatic than it is characteristic. However, there are 10 individuals in this series that received sufficient insight from one interview, that definite progress in the future with psychotherapy was assured. The average number of interviews required centers between two and four, with 23 patients in this series receiving two, 22 patients receiving three, and 13 patients receiving four interviews. In many cases where the material is deep seated, four to seven interviews were necessary. In this series, 13 patients received four interviews, 6 patients received five interviews, 6 patients received six interviews, and 5 patients received seven interviews.

In summary narcosynthesis shortens psychotherapy and renders beneficial the transference relationship, facilitates the lifting of repression, enables the patient to accept and assimilate interpretations of basic conflicts, and aids in the process of synthesis both in the narcotic and wakened states.

Summary and Conclusions

1. A follow-up study of the use of sodium pentothal in anxiety states is presented.
2. Eighty-five cases of anxiety states were subject to a total of 275 interviews with a favorable response.
3. A characteristic case of each category from 1 to 7 interviews is presented.
4. Narcosynthesis shortens psychotherapy and renders beneficial the transference relationship, facilitates the lifting of repression, enables the patient to accept and assimilate interpretations of basic conflicts, and aids in the process of synthesis both in the narcotic and wakened states.

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Improved Electro-Convulsive Therapy With Low Amperage Unidirectional Currents

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Electro-convulsive shock therapy has proven a reliable tool in the treatment of certain psychiatric conditions, especially the affective disorders. Unfortunately, electro-convulsive shock therapy (E.C.T.), as commonly administered with the conventional Cerletti-Bini machine (C.B.) using raw alternating 60 cycle current, produces undesirable and, at times, serious complications which are of concern to both the patient and the physician. These complications may be conveniently divided into three groups: somatic (fractures, dislocations, lacerations, etc.), physiologic (apnea), and mental (post-convulsive restlessness, confusion, psychotic episodes, startle reactions, memory impairment, etc.).

Many psychiatrists have occupied themselves with, and suggested methods to reduce the incidence of, these complications. Much work has been done on the prevention of spinal fractures, notably by E. Friedman et al.,[1] A. E. Bennett[2] and others, as a result of which the spinal fracture rate has been reduced from about 40% to 5%. Suggestions for the use of sodium amytal[3] and other barbiturates[4] to control post-treatment excitement have proved very helpful. Methods of handling post-treatment apnea once it has occurred have been detailed;[5,6] however, no practical preventative has been suggested. So far, little or no mention has been made of methods to prevent other "mental" complications of electroshock therapy, especially the distressing and sometimes long lasting post-treatment memory disturbances.

The present communication concerns itself with the successful control of post-treatment memory disturbances, psychotic reactions,

post-convulsive apnea, fractures and other complications of E.C.T. when using the Reiter Electrostimulator #1 (R.E.S. #1). This instrument has now been in use over 10 years and was first reported on by Friedman[7] and Wilcox.[8] Recent mechanical refinements of the currents employed, as well as changes in the technique of administration, have aroused in many psychiatrists renewed interest in this type of apparatus.[9a-9f]

The R.E.S. #1 employs a unidirectional current consisting of approximately 30 groups of pulses per second. Within each group are roughly 6 steep-walled pulses, each topped by a spike. These 6 pulses are of varying amplitudes and relative phase arrangements within each group. The average current used per treatment, as read by the meter, ranges from 3 to 20 ma., and the average voltage used runs from 1½ volts to 10 volts. Thus, the usual average treatment requires an average current of about 7 ma. and an average of 3½ volts. (Of course, the peak currents represented by the single-duration spikes may go as high as 400 ma. at infrequent times during one treatment). We have called treatment administered with this current, "Low current" treatment.

The convulsion produced by the "Low current" of the R.E.S. #1 differs from that of the Cerletti Bini (ordinary E.C.T.) machine in the following ways:

(1) The current is applied for the entire duration of the convulsion, 40-60 seconds instead of a fraction of a second. Although the current is applied throughout the entire duration of the convulsion—that is, 40 to 60 seconds—the total amount of electrical energy administered is much less than that administered in the Cerletti Bini treatment. Furthermore, only that part of the current administered from the beginning of the treatment until the patient enters the tonic phase (usually 5 to 15 seconds) is convulsive in nature, while the rest of it, lasting from 35 to 45 seconds, is stimulative to the respiration and of extremely low amperage (1 to 3 ma.).

(2) There is no flexor jerk or spasm. Instead, as soon as the current is turned on, the body assumes a posture of decerebrate rigidity, with adduction of the arms and flexion of the forearms, extension of the lower limbs, retraction of the head and closing of the eyes, and undergoes a series of fine clonic twitchings (induction phase), which cease with the onset of the tonic phase of the convulsion.

(3) The tonic phase differs from that seen in the C.B. convulsion in that the mouth remains closed, there is no epileptic cry and no conjugate deviation of the head and eyes to one side. The tongue at no time protrudes and there is no necessity of a protective mouthpiece. The tongue is hardly ever bitten.

(4) Due to the fact that the current is not turned off at the beginning of the tonic phase and is administered throughout the tonic and clonic phases, there occurs a modification of these two phases of the convulsion, which is best seen in the remarkable suppression of movements during the clonic phase. This was originally described by Tietz and associates in their work on electronarcosis.[10] If the current is kept high enough throughout this phase, complete supression of clonic movements is obtained, in which case the patient remains in a "tonic state" throughout the convulsion, the end of which is signalled by resumption of breathing. On the other hand, if the current is reduced at the beginning of the tonic phase, as in our technique (see appendix), only partial suppression of the clonic movements occurs, and the less the current administered, the less the suppression obtained. Modification of the tonic phase, as already mentioned, is reflected in the suppression of the opening of the mouth and eyelids, prevention of the epileptic cry and conjugate deviation of the eyes and head.

(5) The tonic-clonic phases are shorter than in the C.B. convulsion and their duration is dependent, to a large extent, upon the duration of the induction phase. The longer the induction phase lasts, the shorter the duration of the ensuing tonic-clonic convulsion. The tonic and clonic phases are milder than in the C.B. convulsion.

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(6) There is practically no post-convulsive apnea as the current stimulates respiration and is not turned off until the patient begins to breathe. The entire treatment and the length of application of current lasts from 40 to 60 seconds, which is of the same duration as the C.B. convulsion.

(7) Following the convulsion, the patient makes an unusually quick recovery as a rule becoming oriented in from one to five minutes. With very rare exceptions, there is no post-convulsive agitation or startle reaction.

We have treated over 400 patients with the R.E.S. #1 and have had vertebral fractures in only five; a percentage rate of 1¼. This is less than that reported by some observers using curare.[11] Wilcox,[12] employing similar currents, had only a "few" fractures in over 2,000 patients treated. The fracture rate with this apparatus is so low as to make the use of curare superfluous.

The number of patients with memory impairment was very low. Three had "memory loss" complaints which were mild and of short duration. In none of our patients have we had psychotic reactions during the course of treatment. Post-treatment apnea occurred in only two patients, both of whom had been given pentothal prior to treatment. No other complications of any consequence were noted in our patients. The clinical results have thus far been tabulated in only 200 of the 400 patients, and are as follows:

Depressions	86% recovered or improved.
Schizophrenics	66% recovered or improved. (These included many patients with acute schizophrenic reactions.)
Psychoneurotics	22% recovered. (The number of psychoneurotics included here is small and not statistically significant.)

The average number of treatments given was 8.9, which compares favorably with the C.B. machine, which averaged 10 treatments per patient.

A few patients, for inherent reasons, do not respond to the extremely low currents described above. These patients are usually agitated depressives with high convulsive thresholds, or patients who have had many previous treatments with the C.B. machine. For the successful treatment of these patients, the R.E.S. #1 contains another convulsive current. This is a unidirectional current consisting of sixty half-sine waves per second. The average current used runs from 40 to 80 ma. The corresponding average voltage runs from 20 to 40 volts. We have called treatments given with this current, "High current" technique. (See appendix.)

Discussion

Treatments given with the Reiter Electrostimulator greatly simplify and facilitate electro-convulsive therapy. In addition to controlling the complications listed above, there is one other advantage which is worth comment; namely, the elimination of the epileptic cry. In the usual Cerletti-Bini convulsion, a horrifying convulsive cry is produced with most treatments. With the Reiter Electrostimulator the cry is entirely eliminated. Due to this advantage, this instrument is more acceptable in the treatment of patients in out-patient departments and in physicians' offices.

It has long been thought by a number of psychiatrists, notably Cerletti,[13] Kalinowsky[14] and others, that the therapeutic result in convulsive therapy is achieved by the convulsion itself and not by the stimulus. The "mental" complications of electro-convulsive therapy have also been attributed to the convulsion itself. Work with our unidirectional current apparatus supplies evidence that strongly refutes this contention. It has already been shown by Wilcox and Banay,[15] Hirschfeld,[16] Alexander 17 and others that with this type of machine one can obtain, in some patients, excellent results with non-convulsion producing currents. The data of the present study show an extremely low incidence of memory changes, psychotic reactions, etc., which suggests that the "mental" complications of electro-convulsive therapy are not dependent on the convulsion alone. We believe the extremely low incidence of complications when using the R.E.S. is due to (1) the very low current we employ and to some extent, to (2) the "stimulating" current used after the patient has entered the tonic phase (Note A).

NOTE A. The memory changes are related to the maximum rate of electrical energy employed, which is in turn related to the maximum current used. The rate of energy employed with the R.E.S. No. 1 is flexibly adaptable and roughly 1/25 of that used with the C.B. machine.

The reduction of the fracture rate is related to a number of factors, such as the abolition of the flexor spasm, the gentler tonic convulsion and the suppression of the clonic phase of the convulsion. At the present time, we are unable to tell which of these three factors is the most important one.

The almost complete control of post-treatment apnea may be due to the low current values used, and the stimulating current given after the tonic phase.

Summary and Conclusions

1. The convulsions produced by the ordinary Cerletti-Bini machine and the Reiter Electrostimulator #1 are described and contrasted.

2. The technique of administration of the "low" and "high current" treatments with the Reiter apparatus are described.

3. If the treatment is properly administered, the patient loses consciousness at once, has no memory of treatment and rarely develops anxiety or fear. In our experience there has been less fear with the Reiter Electrostimulator than with the common Cerletti-Bini machine.

4. The clinical results achieved with the Reiter Electrostimulator #1 are the same as those obtained with the Cerletti-Bini machine with this exception; that the quality of improvement is superior in patients treated with the former. Unlike patients treated with the Cerletti-Bini machine, patients in our study *did not develop disturbing memory defects* at the end of a series of treatments and, therefore, were more amenable to psychotherapy and also able to return to work soon after treatment.

5. The incidence of spinal fracture, memory loss, and other complications of electro-convulsive therapy is greatly diminished.

6. The rarity of memory impairment and the control of the other complications of electro-convulsive therapy are due, we believe, to the low rate of energy or current used to produce the convulsion.

7. The convulsion per se is not responsible for the "mental" changes in electro-convulsive therapy. Evidence to support this belief is found in the fact that though the same number of convulsions are produced in any patient, memory and other changes are much more commonly seen in patients treated by the Cerletti-Bini machine.

8. The number of treatments needed to produce effective clinical changes is roughly the same for both machines.

9. The Reiter Electrostimulator #1 is especially suited for use in physicians' offices or in out-patient clinics. No convulsive cry is induced, the treatment is quiet and there are fewer somatic complications.

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APPENDIX

The technique of the R. E. S. No. 1 is as follows:

"Low current" technique. The psychiatric indications and instructions for the preparation of the patient prior to the administration of treatment are exactly the same as those for the C. B. technique. Pentothal sodium, 0.3 to 0.5 gm., is given intravenously only if the patient is very anxious, fearful or uncooperative. The patient is placed on a firm bed with support under his dorsal vertebra. A mouthpiece is not needed. The electrodes are applied to the patient in either bi-temporal or in biparietal position, one inch above the top of the ears, or the Wilcox-Friedman-Reiter Vertex-Left temporal position. Two assistants, one on each side, hold the patient lightly during the convulsion. Very dilute salt or sodium bicarbonate solution is used as the electrolyte. The panel of the machine is set as follows (Refer to Diagram):

(1) Treatment position, Knob "A," is turned to position 3.

(2) Meter scale, Knob "D" is turned to Low.

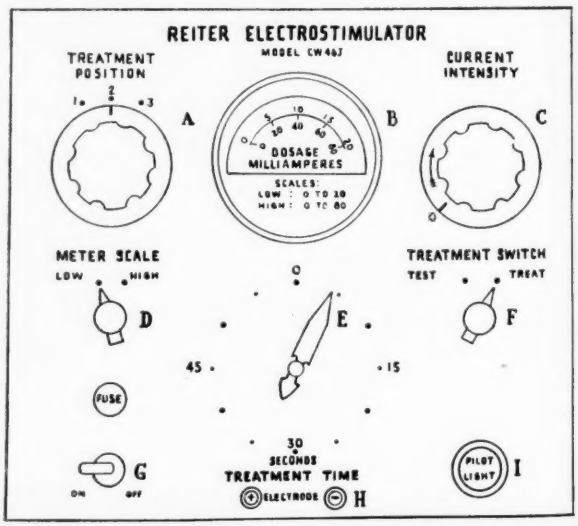
(3) Treatment Switch "F" is turned to Test, and main Switch "E" is turned to On.

(4) Current intensity Knob "C" is turned clockwise until the ammeter "B" registers 5 ma. The electrodes are connected from the electrode outlets "H" on the machine to the electrodes on the patient. The patient is asked to close his mouth, (when he does this, he automatically draws his tongue away from his teeth) and is now ready for the treatment. Treatment Switch "F" is turned to Treat. As soon as this is done, Timer "E," which measures one full minute, begins to run. Five ma. are administered for 10 seconds. If the patient does not enter the tonic phase, the milliamperage is increased to 10, and this is given for another 10 seconds. Should he still not enter the tonic phase, the current is increased to 20 ma. and kept at that level until the patient enters the tonic phase. (If patient's arms rise toward his head when the current is first applied, the current intensity must be raised much more rapidly toward 20 ma. to insure adequate amnesia for the treatment.) As soon as the patient is in the tonic phase, treatment position Knob "A" is turned to position No. 1 and the current is reduced to 3 ma. This is the stimulating current and stimulates respiration. The current is allowed to pass for 45 to 60 seconds, at which time, should the patient not breathe, reduce the current to 1 ma. This usually induces breathing. Once the patient begins to breathe, the current is shut off. This is the usual technique. Minor modifications may be used for particular situations.

Treatments are usually given two or three times a week or more often in emergency cases.

"High current" technique. The patient is placed on a bed, as described above. The instrument panel (refer to Diagram) is prepared in the same manner as in the low current treatment, except that the meter scale Switch "D" is turned to High. When this is done, the lower numbers, 0 to 80 on ammeter "B," should be read. The ammeter is preset to 40 ma. and the current is raised to full scale after the treatment is begun. When the treatment is given, the patient enters a tetanic state with extension of arms and legs and retraction of the head. (This condition resembles a state of decerebrate rigidity and has much the same appearance as the tonic phase of the convulsion.) The transition between the two is noted by movements of the limbs, such as extension of the feet, adduction of the arms, etc.

It is often difficult to determine whether the patient is in the tonic phase. This can be established by lowering the milliamperage. If the patient is not in the tonic phase, the musculature will relax; if he is in the tonic phase, the convulsion will continue. Once the patient is in the tonic phase, turn the meter scale Switch "D" to Low, and the rest of the treatment is continued exactly as in "low current" treatment.



Adrenal Cortex Extract Therapy In Acute Alcoholic States

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The problem of alcoholism has been studied intensively as an illness based on neurotic personality structure. It has been considered an escape mechanism resulting from frustration in reacting to external social factors and unsatisfactory interpersonal relations. In recent years a new concept has been introduced, giving promise of a more complete understanding. Significant biochemical changes have been reported, calling attention to pathological responses in the internal environment of the alcoholic, and stressing endocrine imbalance and altered metabolism as important etiologic factors.

Selye[1] stated that emotional reactions, such as worry, tension and grief, cause glandular imbalance, and that these stimuli when associated with alcoholism may produce hypertrophy of the adrenal cortex, ultimately leading to hypoadrenocorticism. The endocrinologic aspects of alcoholism have been studied by Tintera and Lovell,[2] who describe two types of alcoholics. The first group is composed of young asthenic males with sparse chest hair and soft smooth faces. Hypotension and gynecomastia are frequently found. These patients have a low constitutional tolerance for alcohol and show a triad of low androgens, low 17-ketosteroids and hypoglycemia, indicating varying degrees of hypoadrenocorticism. The second group consists of persons without pre-existing hypoadrenocorticism. These are alcoholics who, as a result of chronic overindulgence, have damaged their adrenal cortex and other glandular structures concerned with the metabolism of carbohydrates. Based on the assumption of a state of hypoadrenocorticism (latent in the first group, induced by excessive alcohol intake in the second group), these authors have reported favorable therapeutic results in acute alcoholic states with adrenal cortex extract administered intravenously in divided doses over a period of five days, followed by smaller intramuscular doses twice a week for three weeks after discharge from the hospital, then at weekly intervals for an indefinite period. Smith[3] presented the hypothesis that alcoholism is primarily based on pituitary insufficiency and that adrenocortical and gonadal hypofunction are secondary phenomena. He recommends ACTH intramuscularly, in doses of 100 to 150 mg. divided over a 24 to 36 hour period, in the treatment of delirium tremens. In a more recent publication, Smith[4] concludes that adrenal cortex extract (ACE) is effective in Korsakoff's psychosis, while ACTH is not; that both ACE and ACTH are effective in the treatment of acute alcoholic intoxication; and that ACTH is the most effective treatment in delirium tremens.

To determine the clinical response to hormonal therapy in acute alcoholic states, we treated 14 patients with adrenal cortex extract. The extract used contains the cortical principles essential for life and is practically free of epinephrine. The cortex hormones are separated from water-soluble toxic contaminants. Each cc. contains not more than 3 mg. of gland extractive solids. The extract is biologically standardized, each cc. containing not less than 50 dog units of cortical activity. The patients were from 28 to 54 years of age. All gave a history of chronic alcoholism of a number of years' duration. Included in this series were patients with a diagnostic classification of delirium tremens, acute alcoholic hallucinosis, acute alcoholic intoxication, depression and anxiety, convulsive disorder and schizophrenia.

Case Reports

Case 1. G.H., a 35 year old smelter, was admitted to the Medical Service 8-7-50 with cough, pains in extremities and generalized seizures. He had been drinking one to two quarts of whiskey a day. Examination revealed findings of atypical pneumonia, marked generalized tremor, and absent reflexes in the lower extremities. He was treated with sedation, but became progressively more agitated and developed hallucinations and delusions, necessitating transfer to the Psychiatric Service. He was then given ACE, 10 cc. i.m. every three hours for three doses, followed by 5 cc. i.m. for two doses. His hallucinations subsided within twelve

hours and he ate and slept well without sedation.

Case 2. J.D., a 41 year old accountant, was hospitalized twice and treated with ACE for acute alcoholic psychosis. He gave a history of excessive alcoholism of four years' duration. His first admission on 8-22-50 was characterized by auditory hallucinations, tremulousness and severe anxiety; 10 cc. of ACE were given i.m. every six hours for four doses. His symptoms cleared within twelve hours. On 11-23-50 he was readmitted, with marked tremor, agitation and severe depression with self-accusatory ideas and suicidal preoccupation. He again responded promptly within twenty-four hours when given ACE, 10 cc. i.m. for two doses, then 5 cc. for two doses.

Case 3. E.D., a 31 year old musician, was admitted 8-23-50. He had been drinking heavily for two years and gave a history of visual and auditory hallucinations for several days. The day prior to admission he had several convulsions. Examination revealed a typical picture of delirium tremens, with marked tremor and active hallucinations. He was treated with ACE, 10 cc. i.m. every six hours for four doses. He showed rapid improvement, his hallucinations subsided and he was able to sleep without sedation on the night of admission. Within twenty-four hours his tremor ceased and he was eating well.

Case 4. W.B., a 35 year old laborer, was admitted 10-21-50, because of agitation, tremulousness and disorientation. He had been drinking heavily for at least five years. Four doses of ACE, consisting of 10 cc., were given i.m. at six hour intervals, and his symptoms subsided within twenty-four hours.

Case 5. E.B., a 40 year old cook, was admitted 10-27-50, with symptoms of tremor, anxiety, depression, anorexia and insomnia. He had been drinking excessively for three months. Examination revealed a coarse tremor and marked restlessness. He was treated with ACE, 10 cc. i.m. for two doses, and responded quickly in twelve hours with relief of tension and tremor.

Case 6. O.K., a 33 year old cook, was admitted to the hospital 11-3-50 with marked tremor, anxiety and insomnia as a result of acute alcoholism. He gave a history of chronic drinking over a period of 15 years, averaging 1 to 1½ quarts of whiskey per day. He received ACE, 5 cc. i.m., every three hours for four doses, as well as vitamins and paraldehyde. In sixteen hours he was relieved of tension and anxiety, ate well and attended a movie.

Case 7. R.B., a 34 year old carpenter, admitted 11-24-50, gave a history of chronic alcoholism of many years duration. Three weeks prior to admission he stopped drinking heavily and during the last several days began having visual hallucinations and delusions of persecution. Examination showed him to be tremulous, agitated and hallucinated. He was treated with ACE, 10 cc. i.m. every six hours for four doses, then 5 cc. i.m. for two doses. His hallucinations and tremor ceased within twenty-four hours and he started eating well.

Case 8. G.W., a 39 year old laborer, entered the hospital 12-15-50 with symptoms of cough, fever and pleuritic pain of one week's duration. He gave a history of excessive alcoholic intake over many years. Physical examination showed signs of lobar pneumonia in the right middle lobe. Shortly after admission to the Medical Service he developed hallucinations and delusions, as well as belligerent behavior, necessitating transfer to the Psychiatric Service. He was given ACE, 10 cc. i.m. every six hours for four doses, and his hallucinations subsided. The pneumonic process was treated with aureomycin. He made a complete recovery.

Case 9. E.T., a 54 year old jeweler, entered the hospital 12-23-50 on the Orthopedic Service because of a fractured ankle. There was a history of excessive alcoholism for at least six years. On the third day of his hospitalization he became confused, hyperactive, tremulous and actively hallucinated. He was treated with ACE, 10 cc. i.m. every three hours for two doses, then every six hours for two doses, and 5 cc. i.m. every six hours for four doses. He also received vitamins and fluids. His symptoms subsided within 36 hours. However, he had damaged his cast and when he returned from surgery, where it was repaired, four days later he again developed his previous symptoms. He was again given ACE, 10 cc. i.m. every six hours, plus sedation and vitamins. His mental state cleared in three days and remained so for the duration of his hospitalization.

Case 10. L.P., a 40 year old teacher, was admitted 1-4-51 with symptoms of acute alcoholism. He had not eaten for four days and had been drinking heavily for two weeks. He had previously been hospitalized twice for schizophrenia. There was marked coarse tremor of the tongue and extremities and he was unable to walk without assistance. He was treated with ACE, 10 cc. i.m. for four doses, and given fluids, vitamins and sedation, and made a prompt symptomatic recovery.

Case 11. G.W., a 31 year old clerk, was hospitalized 1-7-51 because of agitation, tremulousness, depression, nausea and vomiting. He had been threatening suicide. There was a history of heavy drinking for seven years. He was given ACE, 5 cc. i.m. every four hours for six doses. He responded within eighteen hours, retaining food and sleeping well. He received no other medication except vitamins.

Case 12. L.J., a 36 year old Air Force Sergeant, entered the Hospital 2-6-51 with the complaint that while pushing an automobile he had "passed out," bitten his tongue, had urinary incontinence and had remained dazed and confused for several hours. He gave a history of three similar episodes during the past 2½ years, as well as over-indulgence in alcohol for 5 years. Examination revealed a marked generalized tremor, flushing of the face, restlessness and anxiety. On the second day of his hospitalization he became extremely agitated, talked loudly to himself and hallucinated, giving commands to a team of horses. He was treated with ACE, 5 cc.

i.m. every four hours for five doses. The following day he was quiet and cooperative, in good contact, eating and sleeping well and reading a book.

Case 13. G.P., a 28 year old janitor, was admitted 2-7-51, with visual hallucinations, marked tremor of the hands and tongue, insomnia and vomiting. He gave a history of heavy drinking for two years. He was given vitamins, fluids and sedation. Two days later he became panicky, running about the ward, hiding under a bed from imaginary monsters which he believed were after him. He was treated with ACE, 5 cc. i.m. every four hours for six doses, during which time his hallucinations and panic reaction subsided. Two days later he had a recurrence of the same type of reaction, which again cleared with ACE, 10 cc. i.v. in three doses.

Case 14. L.S., a 41 year old metal smith, was admitted 2-8-51 with a marked tremor, tension, anxiety and a hostile and belligerent attitude toward his wife. He had been drinking heavily for four days and gave a history of excessive alcoholism of eight years duration. Examination revealed a generalized coarse tremor, increased perspiration, gastritis, and an attitude of hostility. He was given ACE, 5 cc. i.m. 4 times a day for 2 days, then 5 cc. twice daily for three days. Within 24 hours he was much improved, the tremor had subsided and his appetite returned. After 48 hours he felt completely well.

Discussion

The above case reports show that all 14 patients responded favorably to adrenal cortex extract therapy. It will be noted that the extract was given intramuscularly and that intravenous injections were reserved for cases of an emergency nature only. The dosage and the interval between injections were adjusted to the severity of symptomatology. The length of treatment was determined by the clinical response of the patient and the alleviation of symptoms. It was found that the following measures routinely used heretofore in the treatment of acute alcoholic states, need not be employed. Sedation was not deemed necessary, inasmuch as the patients reported a feeling of relaxation and a sensation of warmth conducive to natural sleep, usually after the first injection of ACE. Vitamins were not required, since good appetite returned within 12 to 24 hours. Parental fluids were not indicated due to adequate oral intake. The following symptoms were beneficially influenced: visual and auditory hallucinations, delusions of persecution, generalized tremor, agitation, belligerent behavior, depression, suicidal preoccupation, insomnia, anxiety, anorexia, disorientation, confusion, vomiting, gastritis, and increased perspiration.

The mechanism of the action of adrenal cortex extract in alcoholic states is based on the assumption that a state of hypoadrenocorticism exists. As pointed out by Goldfarb and Berman,[5] it may be concluded, on the basis of available clinical and experimental evidence, that chronic alcoholism is associated with pluriglandular dysfunction, especially of the adrenal cortex. Smith[6] has approached problem drinking from the medical point of view and postulated his theory of alcoholism as a metabolic disease, the behavior disturbance being only symptomatic of the underlying metabolic disorder. He refers to the biochemical and clinical similarity between delirium tremens and Addisonian crisis, which he explains on the basis of the adaptation syndrome, resulting from a series of repeated stresses. He demonstrated that alcohol given to rats produces chemical changes characteristic of adrenal cortex stimulation. Such recurrent stimulation may ultimately lead to exhaustion of the adrenal cortex and thus to varying degrees of adreno-cortical insufficiency. These considerations first motivated Smith to treating a number of patients manifesting delirium tremens and acute alcoholic intoxication with desoxycorticosterone and whole adrenal cortex extract, which resulted in remarkable clinical improvement.

Substantiation of this treatment method, using ACE in our series of 14 patients, indicates that Smith's theory is sound. It is now desirable to use this and similar therapies on a larger scale. This ultimately may lead to a more complete understanding of all etiologic factors concerned with alcoholism, will result in more effective therapy, shorten hospitalization, and perhaps prevent personality deterioration.

Author's Note: The foregoing article has been reviewed in the VA and is published with the approval of the Chief Medical Director. The statements and conclusions published by the authors are the result of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

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Neurological Clinical Pathological Conference

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CHARLES D. ARING, M.D., *Editor*

CASE NO. NP-47-153

Presentation

A 63-year-old white man was admitted to the hospital late on September 6, 1947. That evening while playing bridge, he noted a sudden sensation of numbness about the left corner of the mouth and tongue which was followed rapidly by weakness and sensory disturbance of the left extremities. He complained immediately of severe pain in the right frontal and temporal regions. He never lost consciousness.

He had been known to have hypertension for at least 18 years and had been previously diagnosed as having had hypertensive heart disease with occasional episodes of gallop rhythm, gout and nephrolithiasis for which a left nephrolithectomy was performed in 1941. He was in the hospital in 1944 for a bout of bacteremia, and in 1945 for an acute upper respiratory infection.

Examination at the time of his admission to the hospital revealed an alert, cooperative man who seemed in good spirits but who complained bitterly of severe pain in the right temporal region. He had profound left facial weakness and almost unintelligible dysarthria, loss of appreciation of pain and touch in the left side of the face and forehead, paralysis of the left extremities with flaccidity of the arm and slight increase in tone of the thigh muscles; and loss of appreciation of touch and pain on the left side of the body. The deep reflexes were increased on the left; the abdominal skin reflexes were not obtainable; bilateral sustained ankle clonus and Babinski signs were elicited as well as a Kernig sign. The neck resisted complete flexion.

After admission the patient became increasingly restless and drowsy and continually complained of right temporal headache, from which he was consistently relieved by lumbar puncture. Following repeated installations of a rectal tube because of abdominal distension, blood was observed in the stool. On November 21 during an episode of massive rectal bleeding, he developed peripheral vascular collapse for which plasma and whole blood were administered. On November 30 he suddenly developed pulmonary edema and tachycardia, both of which responded satisfactorily to digitalization, following which he began to improve. The stiffness of his neck gradually subsided. The only return of movement was about the left hip which was weak. The sensory abnormalities remitted a bit; there remained stocking and glove hypasthesia and hypalgesia in the left extremities; the speech improved; the left extremities became somewhat spastic with Hoffmann and Babinski signs on that side; an occasional Babinski and a rather constant Chaddock response were elicited on the right. The local headache was inconstant after early November. Despite a certain amount of confusion and alteration of attention, he was allowed to return to his home on December 7, 1947. During the 3 months in the hospital there had occurred periods of prolonged drowsiness, sometimes lasting as long as 18 to 24 hours. He could be aroused from the lethargy but would quickly sink back again. Between the bouts of lethargy, he was relatively bright and alert. There was also some "emotional release."

Laboratory Data: At the time of admission to the hospital the temperature was 98.6 degrees F, the pulse rate 100, respiratory rate 20, and the blood pressure 230/140. The temperature varied irregularly between 98 and 101.6 degrees F and was associated with analogous fluctuation of the pulse rate. The blood pressure remained essentially unchanged except that on November 21 it dropped to 80/60 following the massive rectal bleeding.

On admission the blood counts, hemoglobin determination, chloride, total protein, uric acid and serological reaction were normal as was the stool analysis. The blood urea nitrogen varied from 19.6 to 44.3 mg. per cent; the prothrombin time was 60 per cent; the urine was normal except for persistent albumin. Repeated electrocardiograms revealed myocardial damage with left ventricular strain and roentgenographic examination of the lungs and skull were normal. Angiograms showed normal cerebral vessels on the right.

On December 10 he developed diarrhea and a relapsing fever; the former responded to penicillin, but the latter persisted and reached a high of 104 degrees F. Two days later streptomycin was ad-

The Cerebrospinal Fluid

Date	Initial Pressure	Final Pressure	CC Removed	Appearance	RBC/CMM	Lymph/CMM	Protein Mg %
9/6	220	100	12	Bloody	40,000		
9/8	260	130	12	red tinge Xantho	12,105		
9/11	240	120	10	Xantho	497	12	
9/13	290	130	10	Xantho	130	10	
9/15	320	150	10	Xantho			
9/17	270	130	15	Slightly Xantho	7	1	
9/22	210	150	8	Slightly Xantho	33	7	
9/22	350	150	15	Slightly Xantho			
9/26	230	110	12	V. slightly Xantho			
10/3	230	110	10	V. slightly Xantho	0	0	225
10/10	205	100	12	Water	0	1	142
10/31	220	110	10	Water	3	0	97
11/10	140	105	10	Water	1	0	105
11/21	225	120	15	Water	0	0	100
12/3	170	90	10	Water	5	0	120
12/14	200	100	10	Water	0	0	68

Wassermann and colloidal gold curves were negative.

ministered, it had no appreciable effect on the fever; at this time he developed a gallop rhythm, an eruption over his back, and on the following day a positive Kernig sign and stiff neck. Lumbar puncture was performed on December 14, and the only cerebrospinal fluid abnormalities were an increased pressure (200 mm) and protein (68 mg).

He was readmitted to the hospital on December 14, 1947 where he was found to have abdominal distension, moist rales throughout the left lower lobe of the lung and a brown maculopapular eruption limited to the back. The neurological abnormalities were essentially those present at time of his discharge from the hospital on December 7. The temperature fluctuated in a cyclic fashion between 98.6 and 104 degrees; the height of fever was attained approximately every 36 to 48 hours. There was a concomitant variation in the pulse rate which terminally rose to 146. The routine blood counts and agglutinations and cultures were negative. The BUN was 44 mg per cent on admission and terminally rose to 113. On December 16 plasmodium vivax was found in the peripheral blood; two days later the red cell count was found to be 2,500,000 and a hemoglobin determination was 7.85 gm. The electrocardiogram on December 20 was read as showing myocardial damage with complete A-V dissociation.

He showed no response to therapy, developed hiccoughs, voided small amounts of urine and became stuporous and cyanotic. Despite parenteral fluids, blood, oxygen, quinine and quinidine, he expired 7 days after the second hospital admission and 3½ months after the onset of the final illness.

Differential Diagnosis

Dr. Eugene B. Ferris: This case presents a number of interesting problems in addition to the nature of the brain lesion which began his final illness. The history indicates that this 63-year-old man had been known to have hypertension for 16 years with symptoms of heart disease. He also had gout and nephrolithiasis in 1941, bacteremia in 1944, and an acute upper respiratory infection in 1945.

We see from the history that his present illness started suddenly. While playing bridge he noted a sudden numbness around the left side of his mouth and tongue. Soon thereafter he developed left-sided hemiparesis and severe unilateral headache on the right. With a background of hypertension, that type of onset would make us fairly certain that some kind of cerebrovascular accident had taken place. The physical examination verified that impression and also the fact that he had both motor and sensory involvement of the left side of the face and extremities. These neurological findings, together with the contra-lateral headache, gives the impression that this is a lesion on the right side of the brain in the region of the basal ganglia. It is important to know where the lesion started as there may be several possible diagnoses depending upon this fact. The initial symptom of numbness of the mouth and tongue, followed by weakness of the extremities and face suggests that the lesion began in the thalamocortical tract, which is located laterally in the internal capsule, and migrated mesially to involve the supranuclear fibers for the face and extremities, which are closer to the ventricle. The presence of blood in the cerebrospinal fluid suggests a hemorrhage rather than simple thrombosis, and the migration of the lesion indicates that it leaked into the lateral ventricle rather than rupturing into the subarachnoid space. The relatively small amount of blood found in the cerebrospinal fluid, and the fact that the patient did not lose consciousness, suggests that the bleeding was not massive and that it ceased quickly.

The continued symptoms and rather high cerebrospinal fluid protein, which persisted up to 3 months after the onset, indicate continued activity of the lesion, perhaps organization and cyst formation with intermittent focal cerebral edema, as the cerebrospinal fluid pressure remained moderately elevated and the headache was relieved by lumbar puncture.

We must consider whether this localized cerebral hemorrhage represents the late phase of arteriosclerosis which accompanies benign hypertension. Although the optic fundi are not described, there is nothing to suggest that the patient had diffuse brain edema as is seen in acute hypertensive encephalopathy, but rather he had chronic degenerative vascular disease. There is evidence also of limited functional reserve in the heart and kidneys which could best be explained on the basis of arteriosclerosis. The occurrence of gallop rhythm and the development of pulmonary edema, even though it probably resulted from over-zealous parental fluid administration, suggest limited cardiac reserve. Likewise the slight but persistent elevation of the blood urea nitrogen indicates a very limited renal reserve.

The cause for the massive rectal bleeding is not clear. It could, of course, have been due to trauma from insertion of a rectal tube. Gastrointestinal bleeding is, however, common in uremia but the degree of uremia in this case seems too mild to produce uremic colitis.

Although the patient was not well when discharged, he was steadily improving until a week later when he developed diarrhea and fever. The fever started 19 days after a transfusion, and since malarial parasites were found in the blood, it is quite evident that he contracted malaria from the transfused blood. The course after the development of malaria was fulminating and rapidly fatal, which is somewhat unusual in plasmodium vivax infestation. The explanation probably lies in the fact that malaria exhibits itself in its worst form in organs already diseased, and thus in this case the patient exhibited signs of cerebral malaria, rapidly progressive uremia, and heart block.

My feeling is that malaria caused this patient's death. Had there been more reserve in the organs involved it might have been treatable.

Discussion of Pathology

Drs. I. Mark Scheinker and Philip Wasserman: The leptomeninges were diffusely thickened. The surfaces of the brain revealed no abnormalities. The vessels at the base were soft, thin-walled and without placques. The circle of Willis was normal in distribution.

Sections of the brain revealed an old comma-shaped softening in the corona radiata and the corpus callosum immediately above the anterior tip of the left lateral ventricle. It measured 2 cm. by 4 mm. The recent lesion was in the dorsal lateral portion of the right thalamus. It was a hemorrhage which rather completely severed the internal capsule and destroyed the tail of the caudate nucleus and mesial portion of the putamen and globus pallidus. A section through the lesion has been photographed (Figure 1). The lesion in the right thalamus communicated to the ependyma of the right lateral ventricle. An extremely small cyst of softening may be seen in the lateral nucleus of the left thalamus by referring to the photograph.

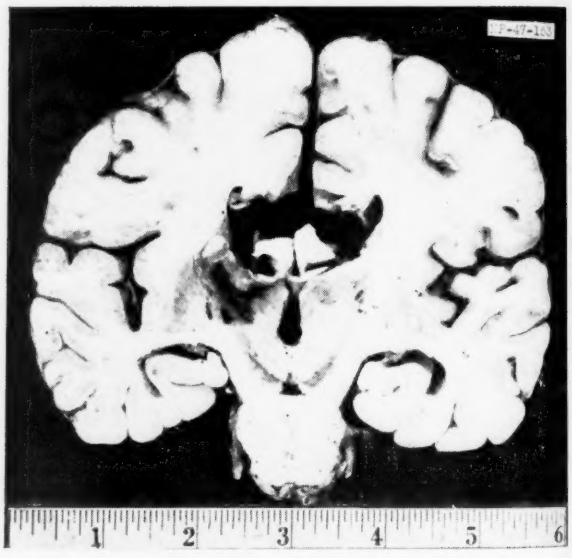

Figure 1. A photograph to show the most recent hemorrhage which was located mostly in the right thalamus. A minute cyst of softening may be seen lying laterally in the left thalamus. The corpus callosum was sectioned at autopsy to allow formalin solution access to the ventricles.

In microscopic section the arterioles generally showed the characteristic hyalinization usually associated with long-standing hypertensive vascular disease. Some of the smaller venules and capillaries were congested and surrounded by minute (perivascular) hemorrhage. There were scattered focal areas of blood pigment accumulation and small foci of glial proliferation, obviously an indication of old and healed hemorrhages.

There was considerable arterial and arteriolar nephrosclerosis. The kidneys grossly were not small, and grossly and microscopically were not suggestive of pyelonephritis. The numerous, small scars involved glomeruli and other parenchymatous structure. Such involvement fits in well, of course, with the clinically observed uremia and the pathologically observed uremic pericarditis.

The heart was hypertrophied but showed little in the way of scarring. No recent myomalacia was present. The coronary vessels, for a man of this age, revealed only slight sclerosis. The spleen was markedly enlarged, weighing 680 gms. It was very soft and a deep purplish red in color. The microscopic examination revealed chiefly acute passive congestion and only moderate pulp hyperplasia. Malarial organisms were not found in the spleen in the sections that were examined.

Of interest, in the light of the past history of pneumonia were the findings in the lung where sections revealed considerable degrees of active and organizing bronchopneumonia. There was also an acute purulent bronchitis and in numerous areas there were small foci of beginning necrosis of the lung parenchyma. Undoubtedly, this severe pulmonary involvement played a role in the terminal clinical state and in the death.

One other item of interest might be mentioned that explains the massive hemorrhage from the intestinal tract. A typical pedunculated glandular polyp was found in the sigmoid colon that measured approximately 1 cm. in diameter. This showed nothing suggestive of malignancy nor was it ulcerated at the time of the autopsy. Incidentally, there were no areas of erosion or ulceration in the colon or in the remainder of the enteric tract such as might have been expected with the considerable degree of uremia that was noted clinically.

Clinical Diagnosis

Hypertensive brain disease with small recent hemorrhage in right basal ganglia leaking into the ventricle.

Transfusion malaria.

Arteriolar nephrosclerosis (uremia).

Bronchopneumonia.

Dr. Ferris' Diagnosis

Intracerebral hemorrhage in the region of the right basal ganglia with leakage into the lateral ventricle, and subsequent cyst formation.

Benign hypertension with chronic degenerative vascular disease in the brain, heart, and kidneys.

Possible chronic pyelonephritis.

Malaria.

Anatomical Diagnosis

Terminal bronchopneumonia and uremia following transfusion malaria.

Hypertensive brain disease with multiple, small, old, and recent areas of softening; recent hemorrhage in the right thalamus, internal capsule and lenticular nucleus communicating with the right lateral ventricle.

Polyp of the sigmoid colon.

Arteriolar nephrosclerosis.

CONGRESS ON MENTAL HEALTH

The Fourth International Congress on Mental Health will be held in Mexico City, December 11-19, 1951, under the joint sponsorship of World Federation for Mental Health, Liga Mexicana de Salud Mental and the Regional Office for the Americas of World Health Organization. Dr. Alfonso Millan, President-elect of the World Federation, is Chairman of the Mexican Organizing Committee for the Congress.

There will be a series of technical meetings with speakers and discussants from the various countries and professions represented at the Congress. In addition to these there will be fifteen to twenty-five international, inter-disciplinary working groups, each composed of approximately fifteen professional people who will meet daily to exchange ideas, to consider approaches found useful in various countries and to make suggestions for future planning.

The Congress registration fee for Members is $12.00 U.S. Currency, $6.00 for Associate members, may be sent to Fourth International Congress for Mental Health, c/o Dr. Alfonso Millan, Chairman, Organizing Committee, Gomez Farias 56, Mexico D. F., Mexico.

Those who plan to attend the Congress should communicate directly with Lona Tours, Inc., Ave. Juarez 56-215, Mexico D. F., Mexico, for hotel reservations, transportation to and from Mexico, and tours within the country.

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